Repair Bond Strength of Resin Composite to Various Restorative Materials

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Purpose

To investigate the repair bond strength (RBS) of a resin composite to six restorative materials either mediated by application of a silane and a bonding agent or by application of a universal adhesive.

Methods and Materials

Thirty specimens were produced from each restorative material: an amalgam alloy (ORALLOY MAGICAP S), a direct resin composite (Filtek Z250), two indirect resin composites (Paradigm MZ100 and Lava Ultimate), a hybrid ceramic (VITA ENAMIC), and a feldspar ceramic (VITABLOCS Mark II). The specimens were stored for 3 months in tap water (37°C) for artificial ageing. After storage, the surfaces of all specimens were sandblasted (aluminum oxide, grain size: 25 µm), water-sprayed, and air-dried.

Subsequently, the surfaces of half of the specimens (n=15/restorative material) were treated with a silane (Monobond Plus) followed by application of a bonding agent (OptiBond FL Adhesive) whereas the other half was treated with a universal adhesive only (Scotchbond Universal). A resin composite (Filtek Z250) was applied as repair material on the treated surfaces and the specimens were stored for 24 hours (37°C, 100% humidity).

Then, RBS was measured by means of a shear bond strength test. Due to normally distributed data (Shapiro Wilk's test: $p=0.216$), RBS-values were analyzed with a parametric ANOVA and two-sample t-tests. The p-values were corrected with Bonferroni-Holm adjustment for multiple testing (significance level: $\alpha=0.05$).

Results

The RBS-values are shown in Figure 1. Mean values (standard deviations) (MPa; Monobond Plus and OptiBond FL Adhesive / Scotchbond Universal) were: 18.6 (3.2) / 17.2 (3.1) for ORALLOY MAGICAP S, 19.8 (3.9) / 17.0 (3.5) for Filtek Z250, 19.9 (3.2) / 17.6 (3.7) for Paradigm MZ100, 20.5 (4.2) / 18.1 (4.6) for Lava Ultimate, 23.9 (5.0) / 17.1 (3.2) for VITA ENAMIC, and 22.3 (4.3) / 12.5 (4.9) for VITABLOCS Mark II.

For VITA ENAMIC and VITABLOCS Mark II, treatment with Monobond Plus and OptiBond FL Adhesive showed a significantly higher RBS than did treatment with Scotchbond Universal ($p \leq 0.0009$). For the other four restorative materials, RBS did not significantly differ between the two treatments ($p \geq 0.207$).

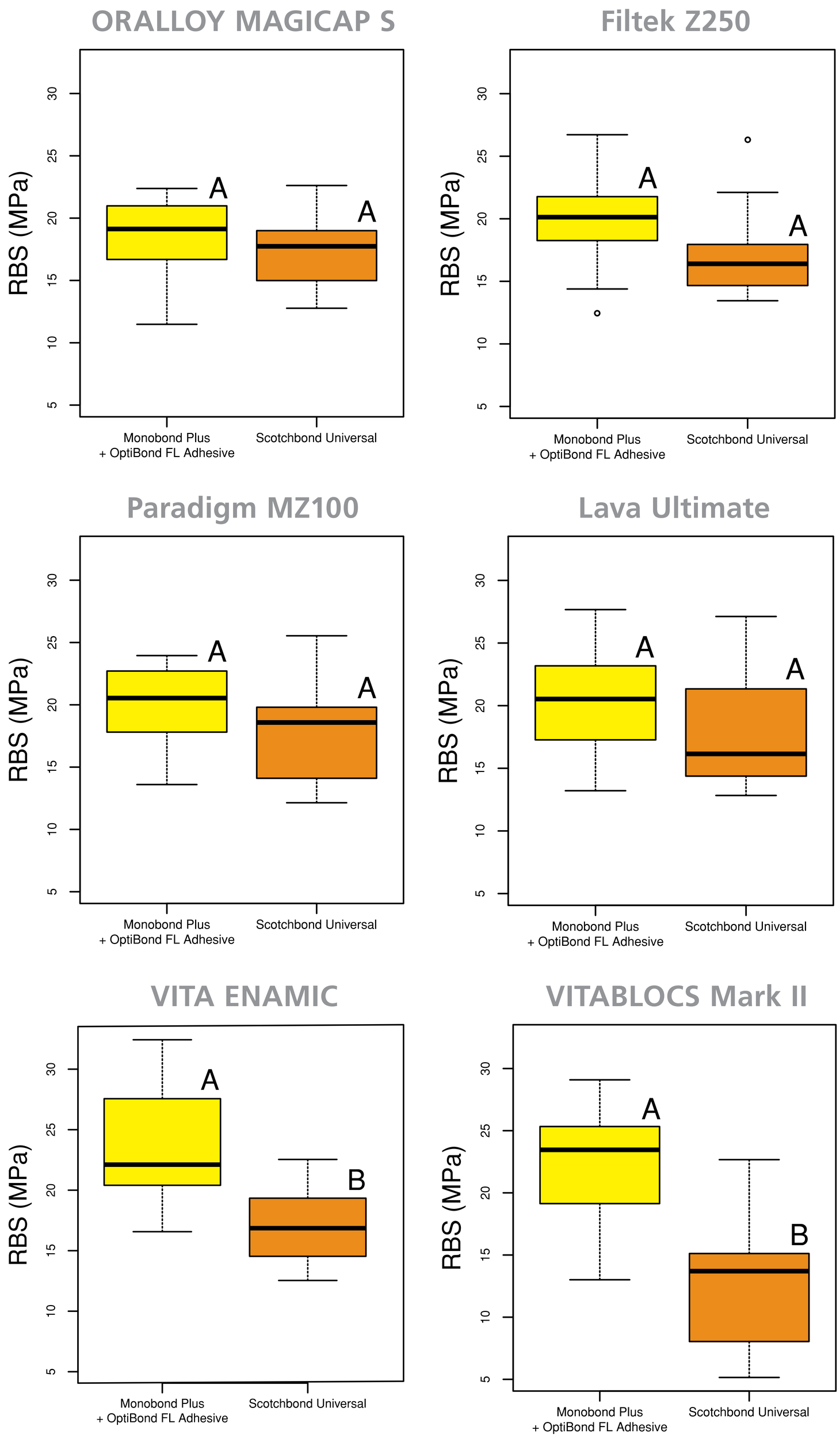

Figure 1: Repair bond strength (RBS (MPa); medians, lower and upper quartiles as well as minima and maxima) of the two treatments for the six restorative materials. Different upper case letters show significant differences between the treatments within a restorative material.

Conclusion

Clinically (with the exception of amalgam alloy), the material of a restoration to be repaired may be unknown. Consequently, when repairing restorations with resin composite it seems advisable to use a silane followed by a bonding agent since for two out of the six restorative materials investigated, the use of a universal adhesive showed lower repair bond strength.

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